
EXECUTIVE SUMMARY

The starting point of this study is that in open gas markets, gas supply and demand can increasingly be balanced by the market. Security of gas supply can be defined as the capability to manage, for a given time, external market influences which cannot be balanced by the market itself.

Compared with other commodities, gas is special: *i*) it is capacity-bound to highly capital-intensive transportation and distribution infrastructure, and *ii*) there is little demand-side response, especially in the household sector. The challenge therefore is to design the market: *i*) *in the short run* to successfully allocate gas volumes available within the capacity restrictions to its highest market value and *ii*) *in the medium to longer run* to mobilise the gas resources and incentivise the infrastructure investment necessary to develop and bring them to the marketplace in time to meet demand.

The key issues therefore are to ensure that markets will, to a maximum extent, provide secure and reliable gas supply all the way to the final customer and deliver timely signals and competitive incentives for investment to guarantee secure supplies in the future.

PART A – GLOBAL/GENERIC DEVELOPMENTS

A changed role for governments and contracts in open gas markets

Reliability and security of gas supply: role of markets and governments

In open markets, supply and demand can be balanced by the market according to the preferences of market participants. Open markets ensure that gas goes to its highest value use. They provide a variety of instruments to mitigate external market influences. However, open markets raise new issues.

With market reforms, no one single entity is responsible for security of gas supply across the *whole* gas market; each company is responsible for its own customers only, and for its part of the gas chain (except for integrated companies).

Open markets will not by themselves value investment in insurance assets to ensure secure supplies to the end-consumer under low-probability/high-impact events, for instance, extreme weather conditions or a large non-technical disruption of supplies. As these events have a very low probability of occurring, market players will not invest in insurance assets against such events if there is no incentive for them to do so.

Therefore, while open markets provide consumers with choice and more efficiency, market reform also changes the well-established business environment that has supported security of supply, and raises new issues that policy-makers must address. Where possible, market mechanisms should be the basis of security decisions. Nevertheless, governments do have a role to play:

- In providing a market framework and its implementation that ensure gas markets can work properly;
- In setting a framework in which risks can be managed and costs reduced, in particular, through securing an international framework for investment and trade, and facilitating interconnection and exchanges among neighbouring countries;
- In determining acceptable reliability levels, especially where small customers and safety are concerned;
- In providing a clear policy for dealing with emergency situations.

The emergence of spot trading

Open markets may come with volatile or high prices. These high or volatile prices will give all market participants the signals that the system may be close to its limits so that market participants on the demand and on the supply side can act accordingly – both short and long term – thereby improving security of supply. On the other hand, volatile prices may lead to speculative behaviour instead of investment, and high prices may lead to the outsourcing of gas-intensive industries. This must be expected in a global economy, but may cost jobs, creating social and political problems. Governments may be concerned about market outcomes and may take them as an impulse to rethink the framework and implement its modification to mitigate market outcomes in line with their

policy. However, dealing with the day-to-day operation of the market is hardly the role of governments.

With the development of more open markets and liquid and deep marketplaces, investors will increasingly base their decision on their assessment of future market development, as seen in North America and the UK. However, in export projects based on the dedication of large gas reserves and the development of large transportation infrastructure, most investors will look for a long-term hedge of their investment risk by using elements of vertical integration or by using the feature of long-term contracts, adapting them to the new market realities.

The evolving contractual framework

For each link along the chain – from exploration and production to the final user who pays for the gas itself or the service created by the gas – long-term contracts may play a useful role and have been applied to hedge long-term risks where the instruments of liquid and open markets were not applicable or useful.

Long-term contracts between suppliers and importers have been the basis of the development of cross-border trade in Europe. Experience in open markets shows that long-term contracts do not disappear with market liberalisation, but will continue to be a fundamental part of the gas supply mix. Even if long-term contracts remain a major part of future gas supplies, their structure and pricing clauses are likely to undergo substantial changes. Already, changes in structure and pricing of new continental European and Asian long-term gas supply contracts can be observed as a reaction to market reform and a portfolio approach by buyers: *i*) shorter terms for new contracts (between 8 to 15 years in Europe and 15 to 20 years in Asia instead of the more traditional 20-25 years); *ii*) smaller volumes (for new contracts or renewals of LNG contracts): 0.5 to 3 bcm/a; these are favoured by the increasing share of gas in power generation and the multiplication of regasification plants; *iii*) greater flexibility in reviewed contractual terms (more flexibility in ToP and swing); *iv*) new price indices (electricity pool prices and spot gas prices).

However, for new greenfield LNG projects there is still a trend to have a major part of the output capacity sold under long-term contracts of 20 to 25 years as an anchor for the project. Whereas long-term contracts allow the financing of large new gas supply sources, spot contracts, which are emerging in Europe, allow a short- and medium-term balancing of supply and demand. Therefore, they offer more efficient use of existing infrastructure and thereby better flexibility and security. They are seen as complementary: spot trading for efficient short-term balancing and long-term contracts for securing long-term supply and large-scale investments.

For forty years, in gas contracts both in the UK and continental Europe, as well as in Asia, netback pricing based on the replacement value was used in long-term contracts. This concept allowed gas to compete with alternative fuels on the buyers' markets, while covering the costs of bringing the gas to the market place – actually to the burner tip – left the remainder for the producers/the resource owner. This fostered competitiveness (in the sectors targeted by the price formula) and gave the resource owner the maximum value for a predictable sales volume.

The pricing issue is more complicated when gas is sold for power generation, where competition occurs ultimately at the busbar. The problem is the difference in the long-run marginal cost and the short-run marginal cost merit order. The benefit of a gas-fired CCGT is not only its higher electric efficiency but also the much lower specific investment costs. This raises the question of how to split the investment premium, which, according to the netback philosophy, would mainly go to the gas seller. The move away from oil-linked price clauses in long-term contracts to contracts with gas-linked pricing poses a substantial challenge to gas sellers, reflecting the major changes in the marketplace.

Market reforms fragment demand, at a time when European supplies from non-OECD countries are becoming more concentrated. Suppliers from non-OECD countries so far retain monopoly structures for their gas export sales.

One reaction of non-EU suppliers to regulatory changes and a perceived high regulatory and market risk is to move downstream, in order to ensure their market outlets and hedge their income.

The new pattern of natural gas supply/demand in OECD countries: impact of the power sector

The global gas industry is in many aspects at a turning point

The gas industry worldwide and in OECD countries is now at a turning point in many aspects, demand, market, trade and supply: *i)* gas demand is changing with a new demand wave triggered by gas to power, *ii)* the gas sectors are opened up to more competition with a new market design, and increased interlink between the gas market and the electricity market, *iii)* the global gas trade is shifting to more LNG trade allowing more flexibility and the mobilisation of more reserves, and *iv)* most IEA countries (except Australia, Canada and Norway) are now becoming import dependent.

The role of gas to cover the increase in electricity demand will differ from country to country, but will certainly be supported by the policy to mitigate GHG emissions by the power sector. The prospects of using more gas for power generation to satisfy the increased demand for power will require additional import of gas. As OECD domestic production is not expected to cover the projected growth, on balance, the increased volumes required by the power sector will be imported gas. Overall, there is no lack of proven gas reserves worldwide and an impressive number of new supply projects – mainly LNG but also some pipeline projects – show the willingness of reserve owners and investors to supply the needs of the markets. However, the interface for imported gas for power generation will need to be addressed.

Impact on security of gas supply of the growing use of gas for power generation

The impressive increase in gas for power generation in the last ten years has been driven by technological development, by the steady increase in efficiency of gas turbines and combined cycles, while specific costs of installed capacity decreased. The combination of gas as a clean and easy to handle fuel with the high efficiency of the new gas turbines and CCGTs makes gas the fuel of choice for power generation to minimise local pollution and GHG emissions. In addition, because of the low economies

of scale of gas-fired power, new capacity can easily be adapted to the development of demand and be deployed close to consumption without loss of economic efficiency. Gas-fired power fits well into competitive gas and electricity markets.

The increase in gas-fired power generation capacity in many OECD countries created a new link between their gas and electricity markets. The use of substantial gas volumes in the power sector brings in a new dimension of price elasticity of gas demand, both short term and long term, based on the alternatives to gas for power generation offered by the electricity system in its totality. On the other hand, as the gas and the electricity systems become more closely interlinked the reliability of the two systems has to be assessed in combination.

Gas use for power generation has become the driver for a second wave of gas demand, as the traditional gas market segments are approaching saturation in many OECD countries. The increased use of gas for power generation has strong implications for both the long-term external security of supply and the short-term reliability of the power and gas systems, because when gas enters the electricity sector, it is the last fuel in the merit order, just before oil products in peaking plants. Governments may also be concerned about the impact thereof on future gas prices as well as the issue of the volatility of gas prices. The increased interdependence between the gas and electricity systems must be addressed.

The rising use of gas in the power sector raises the question of the competitiveness of natural gas against other power alternatives, and what effect this has on gas prices. The increasing use of CCGT plants in the generating systems may affect short-term gas prices, since they can run as multi-fired plants, but would then require lighter oil distillates. This alters the economics of dual-firing (compared to the past, when most dual-firing was based on dual-fired boilers able to burn heavy fuel oil), since lighter distillates, such as gasoil, are more expensive than heavy fuel oil, and shift the balance of back-up fuels away from an almost exclusive use of heavy fuel oil to more and more light distillates. A major risk associated with gas-fired generation in CCGTs in competitive markets is the price volatility of natural gas. Electricity prices are going to be affected by gas price volatility.

Basing large-scale power production to a greater extent on imported gas is a new feature, driven not only by environmental concerns but also by electricity market reforms. This raises the issue of reliability of electricity supply in case of a gas supply disruption, and the question of possible back-up fuels for gas in power plants.

The impact of a gas supply disruption on electricity security will depend on the flexibility developed in both systems. Although 50% of power capacity based on gas is multi-fired, the alternative fuel will be oil distillate, which is much more expensive than fuel oil. CCGT operators do not always have enough economic incentives to store the alternative back-up fuel (even for short periods). In addition, environmental legislation may restrict the use of any alternative fuel and seriously limit fuel-switching possibilities.

The increased use of gas in power generation does not create security of supply problems at present. However, it indicates a need for governments to monitor future developments, in particular in countries or regions where the growing use of gas in power generation is based on increased gas imports. Concerns over security of supply do not justify restricting the use of gas in power generation, however, as long as there is a reasonable portfolio.

Impact of new technological developments on security of gas supply

Technological developments have helped to shape every aspect of gas market demand, supply and trade, and thereby have an impact on security of gas supply. The development of even more efficient gas turbines in the 1980s and 1990s allowed the spectacular growth of gas demand in the power sector. On the supply side, 3D and 4D seismic and large computers to evaluate seismic data, along with the introduction of horizontal drilling substantially improved the finding and recovery rates of gas deposits. Cost reductions in the LNG chain are transforming regional markets into a wide global market. Offshore pipelines can now be built at water depths of 2,000 metres, allowing trade between countries which was previously technically impossible.

The larger-scale use of gas in cars, e.g., in fuel cells, remains a challenge, as costs need to be brought down to a level competitive with cars based on the traditional combustion engine.

The more imminent technological developments, which are aimed primarily at reducing costs, will increase security of supply by enabling access to resources and enlarging the size of gas markets due to the higher economic reach of gas transportation. Major cost reductions in gas transportation are still expected, in particular for high-pressure long-distance pipelines and LNG. This should foster a remarkable development of cross-border gas trade needed to satisfy the increase in demand in OECD countries.

The role of LNG in security of gas supply

Tremendous cost reductions have been experienced in all parts of the LNG chain in recent years. The fall in tanker prices over the last decade led to a much wider economic reach of LNG transportation. The dramatic cost reductions for LNG liquefaction trains, especially for expansion trains, but also for new trains such as the Trinidad and Tobago project, made LNG projects viable even if only part of the capacity is secured by long-term sales. This created an amount of contractually free LNG export capacity, necessary to provide flexibility of LNG supply. The recent re-opening of two US east-coast terminals and the numerous proposed projects to build new terminals in the US and Mexico provide an attractive market outlet, able to absorb all volumes within the capacity of the terminals.

As most of so far undeveloped gas reserves are located far away from OECD markets, it is clear that LNG will play a key role to bring this gas to the market, when distance or natural and political obstacles make pipeline transport impossible.

The growing supply of LNG, accompanied by the increased flexibility in LNG trade, which can physically be directed to the highest value market, are adding to the security of gas supply. Contractual arrangements are also more flexible. Spot and flexible LNG purchases are increasingly used to cover part of peak gas demand. Even though a global gas or global LNG

market may still be a long way off, LNG is already linking different markets together, by allowing shifting volumes between regions, benefiting from differences in their supply and demand balance. Indirectly this adds to the market flexibility of formerly non-connected marketplaces. Some recent events, like the shutdown of the Indonesian liquefaction plant in Arun due to violent attacks and the accident in Algeria's Skikda, have demonstrated the increase in security of gas supply due to the growing flexibility of LNG trade.

The LNG trade is changing and adapting to new market conditions. There is growing recognition on the part of both producers and consumers of the increasing role of short-term and spot sales. These sales play a niche function to sell spare build-up capacity on the producing side, and to complement long-term purchases for buyers. While long-term contracts will remain dominant in the foreseeable future, spot sales (which mean short-term deals or the sale of one cargo) are expected to take a growing share. However, most experts agree that this development will not lead to large-scale trading as happens in the oil market, with an extensive paper as well as physical market. There is an overall consensus that LNG spot trade may amount to 15-30% of global LNG trade.

A more flexible approach to and a wider range of pricing is emerging in the LNG industry. Suppliers are adopting different pricing policies according to the buyers' market. For instance, Qatar, which sells in the three main LNG markets, has pegged its LNG sales to crude oil prices in Japan, to Henry Hub spot prices in the US, to NBP spot prices in the UK, and to fuel oil prices in continental Europe.

Competition between suppliers is fierce as more and more countries are seeking to monetise their gas resources. Due to lower specific costs, project sponsors are absorbing greater risks but also have the potential for higher rewards. Greenfield projects and expansion trains are moving forward without all volumes sold under long-term contracts. The vertical risk-sharing of long-term contracts – still widely used for greenfield projects – is increasingly complemented by vertical integration and by risk taking in liquid markets. In particular, greater integration through equity sharing by various parties along the chain, e.g., upstream equity investment by the

buyer and downstream equity by the seller, evolves as an instrument to improve security of supply.

However, these positive developments for security of supply, including long-term access to more gas resources and extra options to provide additional gas volumes for low-probability events, also bring more import dependence. The development of the LNG trade and industry raises several issues, linked with the location of LNG sources, the financing required to expand production/liquefaction and trade, and the safety of LNG in general.

PART B – REGIONAL ISSUES

Security challenges differ between OECD regions

While all IEA countries have embarked on gas market reform, the basic features of the gas industry vary strongly between IEA members, as do the starting conditions and the status of gas market reform. The existence of domestic gas resources, the development of supply and demand, the depth and liquidity of marketplaces, the role of gas in the power sector and the interlink between the gas and the power sector differ from one country to another. Similarly, what can be covered by the market mechanism in the short run as well as in the long run differs between the various IEA regions and has a corresponding impact in shaping the security of supply issue.

Security of gas supply in North America

In North America, the market plays a primary role to secure supply through supply and demand response to price changes. Due to the large resource base and the possibility of a large, well-interconnected marketplace to react in the short and long term to any curtailment of supply, it can be expected that prices will be able to balance supply and demand in North America, both in the short and the long term. In particular, it can be expected that the capacity of the US/North American market will be sufficient to meet the demand of sectors with inelastic demand.

However, the market outcome may not be satisfactory, due to high prices and high price volatility and their impact on gas-intensive industry and household customers' bills. Demand destruction (e.g., the relocation of

gas-intensive industries to countries with low-cost gas resources) may be an unwelcome market outcome.

The North American market is at a turning point, from a self-sufficient market to a partly import-dependent market. In this new environment, access to secure and diversified long-term supply both from domestic and external sources is essential for future security of gas supply. LNG can play an important role, bringing access to world gas resources and the ability to react quickly to changing market conditions.

Governments might reconsider the access to domestic resources not open for exploration and production so far, while giving due consideration to environmental concerns, and continue to facilitate the building of new LNG receiving terminals by removing regulatory and local barriers. To the extent that the North American market becomes dependent on a significant share of LNG imports, the question of external security of supply should be addressed.

Demand-side response will become an important component of future security of supply, which will allow curving peak gas demand and alleviate tight gas supply situations. Increasing fuel-switching capacity in power and industrial sectors in particular will serve to buffer short-term pressures on the supply/demand balance.

As the supply structure is changing, new investment will be required in transportation and storage infrastructure to meet the future needs of the market. The possibility of relying on long-term contracts and the allowance of appropriate rates of return are two important instruments to foster the building of new pipelines and storage.

Another challenge is the increasing share of gas in power generation, especially when linked to a reduced capability to switch at short term to other fuels. A long-term issue is to what extent investment in other large-scale power production capacity (like coal or nuclear) is restricted due to regulations which make it very difficult, if not impossible, to choose a fuel other than gas. While wind and other “green power” may be promoted by some states, their contribution to the overall electricity mix is projected to remain low in the foreseeable future.

Security of gas supply in OECD Europe

The European gas market is undergoing substantial changes. These changes are driven by major trends: the increase in the use of gas for power generation driven both by market reform and concerns about GHG emissions; the Gas Directive 2003/55/EC accelerating market opening and the unbundling of functions; new actors on the demand side; increasing imports from non-OECD countries; and the shift in the EU eastern border. Profound changes are taking place in the political structure of Europe with the enlargement from 15 to 25 member countries in May 2004 and discussions for further enlargement to the south-east.

Increasing demand will spur the need to build new pipelines and LNG terminals, and increase storage capacity and interconnectivity of the gas grids. Supply and transportation flexibility will decrease as imports have to come from more remote areas and exporters seek to make best use of their assets. This will be partly compensated by increased LNG supplies, which offer more and more flexibility and additional *ad hoc* supplies if the price is competitive with that of other LNG importing regions.

Challenges for security of supply in OECD Europe come not only from a national dimension – which is key – but also from a regional and global dimension. For any EU country, the dimension of a single European market is increasingly important for security of supply as cross-border gas trade develops. A clear understanding of the roles of governments, regulators and companies of the European countries and of the European Commission is essential. With the development of a more flexible LNG market the dimension of global competition with other LNG importers for LNG supplies and investment into the LNG chain is becoming relevant.

The key external challenge of the European market is how to reconcile the objective of competition with the need for many European countries to secure future supplies at competitive conditions in a timely manner from non-OECD Europe. The continental European gas industry is characterised by: *i*) a capital-intensive supply infrastructure and customers who are bound by substantial long-term investment to using gas, and *ii*) a linkage of that infrastructure to remote production facilities, involving long lead-times for investments and considerable reliance on producing countries (increasingly from non-OECD regions), with only a few players

involved. The European Commission's recognition of the importance of long-term contracts for gas supply acknowledges that situation. On the buying side, a credible commitment by the buyer is essential. The buyer has to be given sufficient room to develop the capabilities and the financial strength to aggregate demand, and to purchase and deliver gas to the market in time. A major element is to provide the incentives to invest and the instrument to hedge long-term investment into the transportation infrastructure, such as the possibility of long-term transportation contracts. While much can be left to unregulated competition, where regulation is necessary, it should provide for an internationally competitive rate of return.

Two major internal aspects of market reforms for security of supply are the unbundling of activities – which in turn leads to the unbundling of responsibilities for security of supply – and the lack of clear market signals and incentives for investments in assets for low-probability/high-impact events. Governments thus retain a key role and the overarching responsibility for security of supply, even if the management of security of supply shifts away from governments and incumbent companies to all market players.

Algeria and Russia are major exporters to the OECD European market. After the accident at the Skikda LNG plant in January 2004, which completely destroyed three liquefaction trains, the Algerian oil and gas company, Sonatrach, has been able to meet its contractual commitments by boosting exports by pipeline and from its second LNG plant.

Russia plays an important role for current and future European supply. It is expected that Russian gas exports to Europe will continue to rise. Russia is also considering targeting new markets in Asia (pipeline gas and LNG) as well as entering the Atlantic LNG business. Growing domestic and export sales will call for higher investment in all links in the gas supply chain over the coming decades. Most of the capital will be needed for upstream developments to replace declining production from the maturing Western Siberian super-giant fields that have been the backbone of the Russian gas industry for decades. But a failure to implement much-needed market reforms in Russia, including raising domestic prices to cost recovering levels

and giving third parties effective, non-discriminatory access to Gazprom's monopoly national transmission system, could impede the development of new reserves and the financing of new projects as this would limit the opportunities for independents to develop their own reserves.

Especially important is the challenge of creating a competitive industry structure in the gas sector and addressing the dominant role of Gazprom. The emergence of independent gas producers is a first step to create more competition, but more will be needed in view of the enormous investment challenges ahead. A problem inherited from the Soviet Union – compounded by geography – is the interlink of the gas pipeline systems of the Central Asian countries to the Russian pipeline system as a main link to reach the European market. The issue raised is how to best mobilise the substantial gas reserves of countries like Turkmenistan to contribute to secure gas supplies to the EU.

It is in the interest of the EU's future gas supplies that Russia succeed in mobilising the investment for additional gas export projects. In the long run, the best basis for security of gas supply and security of revenue will be the successful transition to a market economy and a gas industry open to competition in Russia and the transit states, and the successful creation of open gas and electricity markets in the EU. All decisions along the gas chain would then be more uniformly driven by competition and markets. In the meantime the dialogue between the EU and Russia remains vital in furthering a joint understanding of the upcoming investment challenges needed to maintain secure gas deliveries in the future. It will also be important to reinforce proven instruments for gas exports, like long-term contracts and joint ventures, while adapting them to the new realities of opened markets in the EU and to the changes stemming from the further reform needed for the gas sector in Russia.

Security of gas supply in the United Kingdom

The UK gas market is the largest in Europe. Demand has grown rapidly over the past decade, driven by the increasing use of domestic associated gas in the power sector. In addition, the power market has opened up and close links between the gas and power markets have developed in recent years. The UK gas market is different from that of continental Europe. It has

become a fully liquid open market where supply and demand can be balanced by price. For the last twenty years or so, it has been self-sufficient and even a net exporter through the Bacton-Zeebrugge Interconnector. The issue of reliable gas supplies was confined to the internal dimension of security, i.e., ensuring sufficient investment in gas infrastructure. The supply situation is now changing, with a rapid depletion of domestic resources and decline of production after 30 years of exploitation resulting in the need for steeply increasing imports. Several new projects to import gas by pipeline and LNG are being launched, attracted by the liquid UK market. The switch from net exporter to large importer and the changes in the marketplace raise new issues for security of supply for the UK: *i)* increasing import dependence to match a still growing demand; *ii)* availability of peak gas supply; *iii)* facility concentration; *iv)* interoperability of different qualities of gas; *v)* investments in transmission and insurance assets in an open gas market; and *vi)* gas and electricity interface.

The present system of competitive markets and transportation regulation improves reliability of supply by allocating available volumes by the market. However this will not necessarily guarantee reliability of gas supply for low-probability/high-impact events. As long as the UK was completely supplied by many fields from the UKCS under the governance of the UK market, the probability and consequences of a longer-lasting loss of a source were low. This is set to change, as the UK will import gas under some large projects, also from non-OECD countries. The UK has installed comprehensive, transparent monitoring of key developments of the reliability of gas supply situation, which should allow any upcoming concern to be addressed in a timely manner. With growing import volumes this monitoring would have to include the implications of the new large import projects for security of gas supply.

Security of gas supply in OECD Pacific

The gas industries of the four OECD countries in the Pacific region are extremely varied: Japan and South Korea are almost entirely dependent on LNG supplies, whereas Australia is becoming a large LNG exporter and New Zealand is so far self-sufficient. The level of market opening differs greatly too, with Japan and Korea in the relatively early stages of gas

market reform, while Australia has been applying TPA to its grid since 1998. So far the issue has not been relevant in New Zealand, as most of the country's supply comes from one single field, transported and delivered under long-term contracts.

It is therefore not surprising that security of supply issues differ greatly from country to country. In Japan and South Korea, security of supply issues are linked with import dependence, the possible conflict between the opening of the markets and the need to rely on long-term import contracts. The internal dimension of security of supply is linked with investment into new gas infrastructure, the issue of facility concentration and investment in insurance assets for low-probability events. The interface between the electricity and gas sectors is not yet a relevant issue as the share of gas in the power sector is limited and neither sector has yet opened to competition in the two countries.

Although Japan and South Korea are almost completely dependent on outside supplies, their experience shows that this situation can be addressed successfully with policies to diversify supplies, and cooperation with exporting countries and between LNG buyers.

Japan is an illustration of that policy. Japan, as one of the largest economies in the world, has managed to cope well with its very high dependence on LNG (and oil) imports by adopting specific policy measures to address this situation. Japan has always maintained a highly diversified portfolio of supplies: LNG comes from eight countries and ten LNG plants. Suppliers include both Asia Pacific and Middle East producers. Over time, Japan has developed and maintained strong economic and political ties with the countries from which it imports gas always with a view to the interests of the supplying countries. Japan has also developed financial links with its LNG suppliers, by investing in liquefaction plants dedicated to export to Japan.

PART C – ANNEXES

In open gas markets security of gas supply is a subject for which responsibility is shared between all players involved, although they have

different roles to play. This study tried to include the views of the main players by organising conferences and workshops on subjects pertinent to the various aspects of security of gas supply. In addition, it provided the opportunity to include the views of the players by different means, such as questionnaires, written contributions and proceedings of a workshop. The views of governments, regulators, gas industry, large consumers and international organisations are given in annexes included in a CD-Rom.